

L'exemplaire filmé fut reproduit grâce à la générosité de:

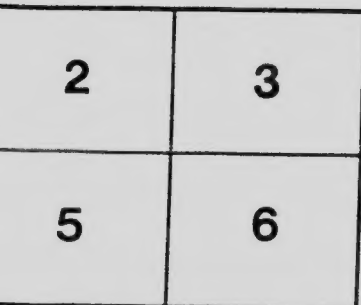
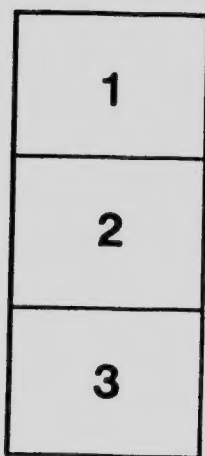
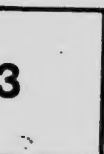
Bibliothèque
Agriculture Canada

Les images suivantes ont été reproduites avec le plus grand soin, compte tenu de la condition et de la netteté de l'exemplaire filmé, et en conformité avec les conditions du contrat de filmage.

Les exemplaires originaux dont la couverture en papier est imprimée sont filmés en commençant par le premier plat et en terminant soit par la dernière page qui comporte une empreinte d'impression ou d'illustration, soit par le second plat, selon le cas. Tous les autres exemplaires originaux sont filmés en commençant par la première page qui comporte une empreinte d'impression ou d'illustration et en terminant par la dernière page qui comporte une telle empreinte.

Un des symboles suivants apparaîtra sur la dernière image de chaque microfiche, selon le cas: le symbole → signifie "A SUIVRE", le symbole ∇ signifie "FIN".

Les cartes, planches, tableaux, etc., peuvent être filmés à des taux de réduction différents. Lorsque le document est trop grand pour être reproduit en un seul cliché, il est filmé à partir de l'angle supérieur gauche, de gauche à droite, et de haut en bas, en prenant le nombre d'images nécessaire. Les diagrammes suivants illustrent la méthode.



DEPARTMENT OF AGRICULTURE
OTTAWA, CANADA

TOBACCO

MANURES IN TOBACCO CULTURE

BY

FELIX CHARLAN

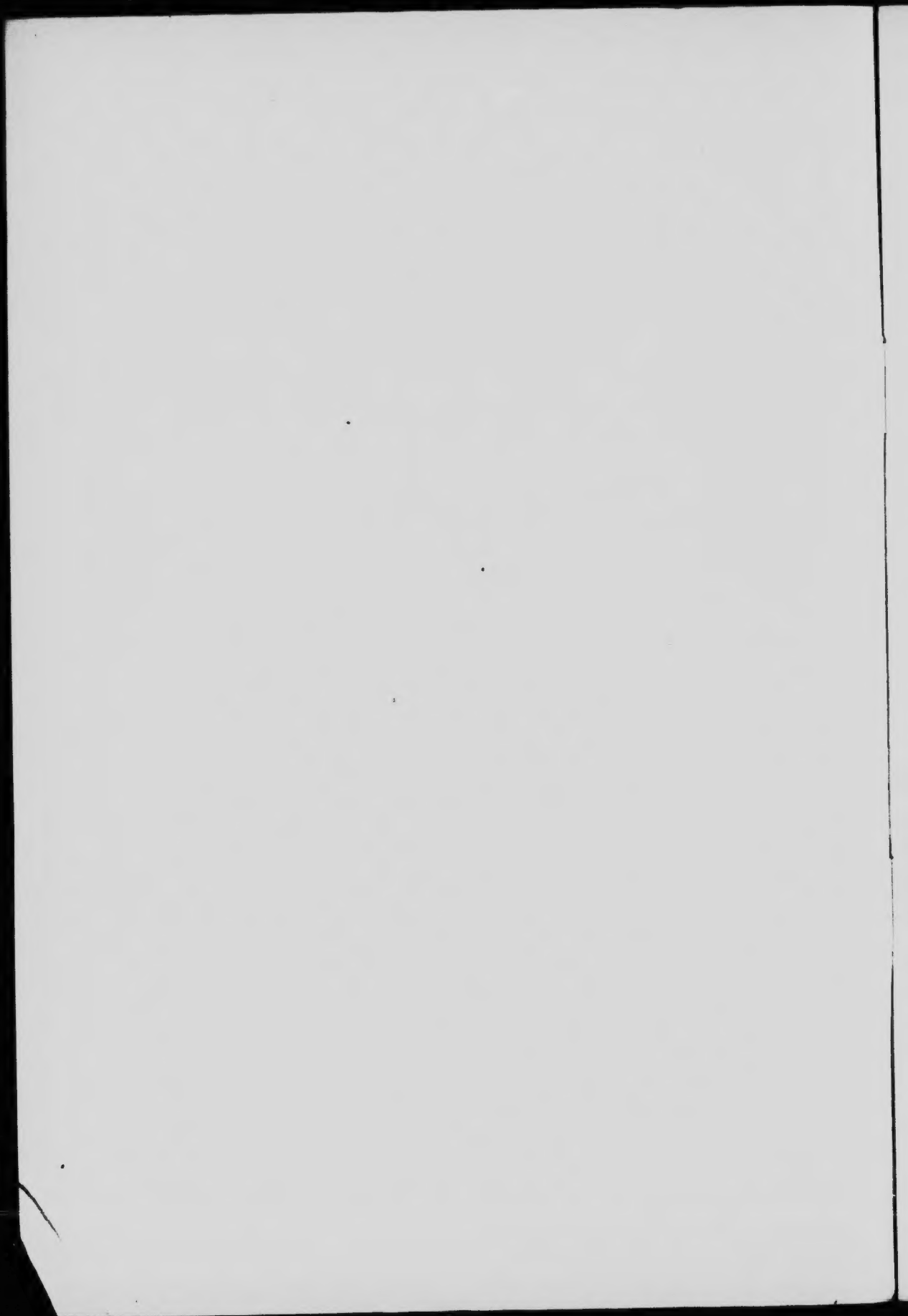
Bulletin relating to Tobacco No. A 2

Published by direction of the Hon. SYDNEY A. FISHER, Minister of Agriculture, Ottawa, Ont.

MARCH, 1906

633.7104
C22





TOBACCO.

MANURE IN TOBACCO CULTURE.

BULLETIN No. A 2.

In visiting the most important centres of tobacco culture in Canada, and questioning the growers, it becomes evident that the quantities of manure used in growing tobacco are, as a rule, insufficient.

The reserves of manure arising from the wintering of cattle, are never very considerable, and the quality would be improved if greater care were bestowed on them, than is generally done. Risk of heavy loss is incurred through negligence.

However rich the land, it cannot produce many successive crops, as exhausting as are those of tobacco, without rapidly becoming impoverished, and even irremediably ruined, unless some of the fertilizing qualities taken from it are (artificially) restored.

This paper will set forth, what are the requirements of tobacco,—showing that they are considerable ;—it will suggest a more rational mode of cultivation than is employed by many Canadian growers, and demonstrate, so that growers using these instructions may clearly understand, the effect of the various commercial manures upon the plant under consideration.

REQUIREMENTS OF A TOBACCO CROP.

Recent experiments show that 1,000 lbs. of leaf tobacco (containing from 22 to 25 per cent of water), absorb from the soil about: 60 lbs. nitrogen, 13 lbs. phosphoric acid, 100 lbs. potash, 83 lbs. lime.

Comparing these figures with the composition of certain good partly matured farm manures, which contain: 0.33 per cent of nitrogen; 0.255 per cent of phosphoric acid, and 0.25 per cent of potash, it is apparent that in order to completely restore the ground, supposing it was done solely with farm manure :—

17,000 lbs. nitrogen, 5,060 lbs. phosphoric acid, 35,000 to 40,000 lbs. potash would be required.

Canadian planters are far from being able to use a corresponding manure, which would represent, for potash, from 17 to 20 tons of manure for 1,000 lbs. of leaf containing 25 per cent of moisture.

It must, however, be borne in mind that the soil is able to furnish, owing to the decomposition of its mineral constituents, a considerable portion of the potash, without which it would be very difficult to carry on the cultivation of tobacco, especially when it is intended to obtain tobacco, sufficiently combustible for smoking.

It must be remarked also that it is advantageous to give the plant the greatest possible quantity of assimilable elements, as the mineral reserves of the soil are slow in action, and a plant which reaches maturity very quickly, needs to find within its reach, and in superabundant quantity, all that it requires.

One should therefore when using farm manure only, spread the manure freely, and as early in the spring as possible so that the manure may have time to be absorbed into the soil and commence nitrification, that is, its transformation into soluble matters; as for the autumn manurings, they must be made only when

ploughing for the last time, so as to avoid too great losses, especially in nitrogen, during winter.

On the other hand if the manure is calculated in such a way as to supply all the nitrogen and potash necessary, and this is what should be done; it will be seen that a considerable portion of the phosphoric acid remains unutilized; this it is that renders the use of a rotation of crops indispensable, to provide for the judicious use of this phosphoric acid, which the cultivation of tobacco could not completely absorb.

Farm manures can only be obtained during the period of barn feeding of cattle, it is quite evident that the quantities then gathered by a planter, who cultivates tobacco to a considerable extent, will often be insufficient, and he will be obliged to have recourse sometimes to the use of commercial manures or 'fertilizers.'

Regrettable errors have occurred in the use of the last mentioned, and it is to avoid their recurrence that this bulletin has been compiled, its object is to induce tobacco growers to discuss the matter in their agricultural societies before placing their orders, so that they may choose only manures suited to their crops.

Below appears a practical plan for estimating the exigencies of tobacco:

'In nitrogen the exigencies are three times greater than those of cereals, ^{about} equal to those of potatoes and of natural prairies, and only surpassed by beets and ensilage corn.

'Phosphoric acid is taken out in proportions which are about equal to those of of cereals.

'In potash which is really predominant in tobacco, it is equal to beets.'

Lime in a fairly good proportion is equally necessary, but this element rarely fails in the soil, and can be easily introduced by means of other crops when the tobacco crop becomes one in a suitable rotation.

ESSENTIAL QUALITIES OF A CROP OF SMOKING TOBACCO.

If particular attention is given to smoking tobaccos, the cultivation of which is more delicate, owing to the great number of qualities which they must possess, it will be seen that they should:—

- 1st. Burn in a satisfactory manner.
- 2nd. Not be too strong, that is to say not to contain too much nicotine.
- 3rd. Be agreeable to the taste.

CAUSES WHICH INFLUENCE THE BURNING QUALITY.

Tobacco burns better the more potash its ashes contain, providing that the potash is combined with organic acids or carbonic acid only, and that it has no chloral composition.

Experiments have been made which prove that we could obtain combustible tobaccos by using as fertilizers, on farms altogether without potash, sulphate, nitrate and carbonate of potash. Silicate gives a result which is barely passable, chloride of potassium gives a very medium burning quality, and when the chlorhydric acid is combined with other matters than potash (magnesia lime), the burning quality is nil.

One ought therefore, before obtaining manures, to acquaint himself with the form in which potash enters into the composition of the fertilizer, and to remember that the most advantageous potash salts to employ (without regard to price) are in the following order: sulphate and carbonate, nearly equal, then nitrate, this last of a very good quality, and silicates; as to chlorides, they can increase the weight of the crops, but they give tobaccos no burning quality.

Potash well employed, either coming from farm manure, or a good mineral formula, (sulphate or carbonate); can act favourably in certain cases upon the fineness and flexibility of the tissue.

Tobacco cultivated on a damp and badly drained farm is usually of a middling burning quality and moreover the colour often remains greenish or dark green.

PERCENTAGE OF NICOTINE IN TOBACCO.

Nitrogenous manures act upon the nicotine, gradually, but slightly; there is hardly anything but sulphate of ammonia that has a somewhat pronounced influence, the muscular flesh follows; this manure is little used in Canada.

Potassic manures have no influence upon the strength of nicotine in tobacco.

The causes which affect the strength of the products, in the slightest manner, are the number of leaves per plant and the spacing between the plants; the planter can vary these as he thinks best suited to their needs; the influence of the variety of tobacco must also be taken into account.

INFLUENCE OF CHEMICAL MANURES ON THE QUALITY OF THE TISSUE.

In this connection, especially for the culture of tobacco with a fine tissue, there is room for caution.

Potash generally acts in a favourable manner, but other products, which sensibly increase the weight, when they are employed in a sufficient quantity, act unfavourably upon the quality. Among these nitrate of soda should be given special attention. It constitutes a convenient and cheap form for giving nitrogen to the soil, but the product obtained is rather heavy, without fineness, often with a loose tissue, and sometimes unsatisfactorily dry, taking a greenish colour, and becoming dark when fermenting.

Sulphate of ammonia has somewhat the same objectionable qualities, and one could say as much of all the artificial nitrogenous manures generally, their effect being to produce a quick result, during which the plant has sometimes hardly time to develop its cell tissue satisfactorily, especially developing the circulatory system.

In agricultural districts where pigs are bred, the watery and cold manures furnished by these animals, ought to be set aside, as if mixed with a large proportion of farm manure, they might lead to the production of tobaccos of bad flavour and with coarse tissue.

CONTINUOUS CULTURE, WITHOUT SUFFICIENT MANURE, EXHAUSTS THE SOIL.

Farmers in certain parts of Canada, believe too easily that it is possible to grow tobacco continuously on the same land. This could be practiced strictly, if the elements taken from the soil were replaced by strong manures, but such is not always the case, and it is well to remember that tobacco cultivated for too long a period on the same soil, the latter being insufficiently manured, will certainly ruin the land. The use of commercial manure can relieve the seriousness of the situation a great deal, but its abuse may lead to an unfavourable modification in the nature of the land, and as the inert matter that covers what it produces and of which it guarantees the quality, is more often neither good nor bad, one might come to the cultivation of a farm which has no resemblance physically or chemically to that upon which he first started.

Heavy amounts of farm manure are not sufficient in themselves, notwithstanding their considerable contribution in decomposed organic matter, to maintain the necessary fertility.

There was a European farmer who used 75,000 lbs. of farm manure ^{per acre} on the only piece of land he had, and could not maintain the continuous culture of tobacco, which he counted upon, for more than five years. After obtaining very fine results, especially the second and third years, there came a sort of exhaustion of the soil and the tobacco crops became very thin in tissue, with fibres too large in proportion, and standing out, remaining, however, a product developed it was not possible to class as of good quality. The experiment had to be abandoned.

HOW TO EMPLOY MANURE.

Referring to what has previously been mentioned and before terminating the brief considerations on the use and the effects of chemical manures, this is the place to give tobacco growers a little advice as to how to manure their land and carry on the cultivation.

A farmer able to consume 30,000 lbs. of good farm manure per acre will find himself in a very favourable position.

When winter ploughing can be effected, it is an advantage to bury part of the manure when ploughing for the last time, stocks of manure are at that time light, as the cattle are generally out to pasture, but they should be utilized; as to spring manuring, it should be done as early as possible.

Great inconveniences arise from spreading farm manures on the eve of transplantation; (heaving of the earth produces a tardy nitrification at the time when the plant has already accomplished a great part of its development, and it delays maturing and gathering.)

Planters who have not sufficient farm manure at their disposal, can complete their manuring by the addition of commercial manure. This latter should be spread lightly before the last spring ploughing, and well mixed with the soil. The spreading of the manure has no inconvenience when the culture is somewhat close, and this will be the case with light tobaccos; tobacco roots cover a large surface and absorb to a very great extent, if not entirely the soluble matter placed at their disposal.

Good council given by certain authors, which has the object of specially hastening development at the beginning of vegetation, is to put a small quantity of manure at the foot of, or around each plant; in this case the manure must be mixed from five to six times its volume in earth, so as to avoid the burning of the plants, which might occur in case of a light fall of rain capable of concentrating dissolutions within reach of the roots. The spreading of furrows can be employed for cultivating with great distance between plants where it might be feared that the roots would not cover the extent of the field.

At any rate when artificial manure is employed with farm manure, the effect of the chemical manure should be especially to hasten the growth of the plant at the beginning, and to stimulate first vegetation; the tobacco having developed a powerful netting of roots is afterwards under favourable conditions for utilizing the stock of organic matter that the farm manure can put at its disposal.

In cases where commercial manure is employed exclusively, and supposing that the plant must nourish itself from the stock of fertilizing matter introduced, it would be necessary to furnish for each acre of ground, 75 lbs. of nitrogen, 20 lbs. of phosphoric acid and 125 lbs. of potash. In reality, lands are never absolutely sterile, and track should be kept of what they can furnish to vegetation from their own stock; these theoretical figures can be reduced by the proportion of three quarters which is already strong, and can be increased in the future, if the result does not come up to expectation.

Whenever one has to employ chemical manures, one should proceed by experiments. The intelligent planter should calculate the expense incurred for manure, and set against it the increased result obtained; he will then be in a position to find out the benefit of the operation.

It has already been said that it was preferable not to make tobacco a continuous crop, but to place this plant in a suitable rotation. The consumption by tobacco of phosphoric acid being comparatively small it is perfectly natural to have it followed by a crop of cereals, which will consume the stock remaining from the tobacco crop. (This stock inevitably follows the use of farm manure, as to commercial manures they also generally contain a surplus of phosphoric acid.)

If the cereal be followed by clover, a very fine grass crop and afterwards a good pasture ground will result; this rotation gives, one year in tobacco, one year in oats or some other cereal, one year in clover, which would be good for cutting, and another year in clover for pasture.

The pasturage should be cleared up early in September, which will give the time necessary for thoroughly ploughing the land before winter; this is very desirable in a country where spring work is sometimes difficult, owing to the rigour of the season, and one should have all the latitude required to prepare, under good conditions, for the plantation of tobacco, which will recur every four years. The introduction of clover in the rotation gives to soils, that are poor in lime, under the form of plaster, the element they do not possess, making this contribution of use by having it followed by a vegetable plant, upon which the good effects of plaster are universally known.

Before adopting a similar system of culture, certain planters should perhaps reduce the extent of the land which they set apart for this plant, and they will benefit by making such a change, as the lands that are free can be used for other crops, they will save their manure, and thanks to a better utilization of this last, they will have less trouble, on small farms, in obtaining possibly better results.

The culture of light varieties of tobacco is not yet quite understood by certain planters. In order to obtain tobaccos that are light in tissue and in taste it is necessary to completely give up the idea of obtaining weight per leaf, but the product obtainable per acre can be maintained and even exceeded by closer planting. Maturity can also be made a little earlier, which is appreciable in a climate that is rather cold, and it is preferable to cultivate a greater number of plants per acre than to allow the plant to carry too large a number of leaves, in the first case the leaves are of about equal size, in the second, the top leaves develop insufficiently.

Experience has proven in Ontario (Zimmer), and in certain parts of Quebec, a tendency to cultivate light tobaccos more closely. The planters are well satisfied and they have the intention to cultivate still closer this year.

As to the varieties with great returns in weight (chewing tobaccos), if they are less sensible to certain bad influences than light smoking tobacco, it is good at least to remove from them the manures containing a basis of chlorine and not to abuse the nitrogenous manures which might give them an inordinate percentage of nicotine.

A matter to which the attention of the tobacco growers should be given, is the utilization of the waste of this plant.

The weight of useful matter is really exported, that of the leaves is very weak relatively to the total weight of the product elaborated (stalks, buds, pruned leaves, roots, &c.), and the tobacco leaves remaining on the ground are about three-fifths of the weight of the plant obtained. This proportion comprises the stalks, which in Canada are removed and dried with the leaves.

The stalks represent 22 per cent of the weight of dried matter and contain about one-fifth of the fertilizing elements: nitrogen, phosphoric acid and potash, which were taken from the soil during the period of vegetation. It is, therefore, important to return to the soil the principles removed from it that are not fit for sale. The stalks should be buried and not burnt, as in the last mentioned case an important loss in nitrogen would accrue.

Pruned leaves, as well as the buds removed from the plant during the summer, represent 75 pounds of nitrate of soda, 40 of sulphate of potash and 30 of superphosphate per acre, but these wastes have the additional advantage of being very easily nitrified, and it is for this reason that the product obtained from the clearing done previous to the gathering of earth around the foot of the plant must be buried under it when such work is done.

In every case all these wastes, which sometimes constitute $\frac{1}{2}$ of good organic manure, can act very favorably upon the following crop, and it is evident that tobacco well manured as it ought to be, in order to obtain favourable conditions during a vegetation which is as rapid as its own, does not waste the elements which are at its disposal, providing the planter takes care to restore to the soil the elements which are not exportable.

Certain authors have even gone further, and have been able to state that tobacco constituted, due to its wastes, a veritable green manure.

Tobacco planters should not forget that the aftermaths (buds which grow on the stumps after the harvest), are richer in nitrogenous matter than the leaves themselves.

and as they very easily nitrify themselves, they constitute an excellent organic manure which is acquired without trouble by the rapid transformation of the mineral elements of the soil at the time when the crop does not require any more care and when it is buried carefully before winter time.

It would appear at first sight, that there have been frequent deviations from the object which was set forth at the beginning of this bulletin; but concerning the uses of chemical manures, it is almost impossible to indicate to farmers, not only the exact doses, but also the nature of the matters which are suitable to the fertilization of their soils.

The conditions for each planter are different to those of his neighbour; quantities of farm manure that are disposable, natural richness of the soil (elements that are a powerful factor.)

The special object of this summary, is to put tobacco growers on their guard against the use of manures containing a basis of chlorine, these last mentioned have been used in certain parishes, with deplorable results.

When chemical manures are used, the planters should not only ascertain the percentage of potash, phosphoric acid and nitrogen in them, but also find out under what form these matters are offered, and eliminate those that are dangerous.

They will remember that the manures adapted to tobacco are :—

For the contributions in nitrogen : sulphate of ammonia, nitrate of soda, nitrate of potash (equally for potash) ; for contributions in potash : carbonate of potash, sulphate of potash silicate of potash (in a few special manures) ; for phosphoric acid : superphosphates.

Better still, when certain manures containing a basis of chloral have been used on lands bearing other crops (potatoes, &c.), one ought to avoid planting tobacco in these lands for some years, until they have been sparged.

If the council given above is followed, tobacco would no longer be sown all over the farm, one would select the better land to set apart for a crop which pays so well, if the conditions are good, and adopt a rotation which will admit of the more perfect utilization of the abundant manures contained in the soil.

In a little while, even relatively poor lands would be restored to a fertility above the average, becoming fit and easy to work, and the tobacco crop would once more justify its reputation as a beneficent crop, not properly speaking because of the ~~good~~ ^{elements} it carries to the soil, and ~~which is not its least important residue~~, but because it is set in the earth under conditions of fertility necessary to obtain the best results with the other crops which constitute the rotation of which it is the chief.

are only residues of too little value





